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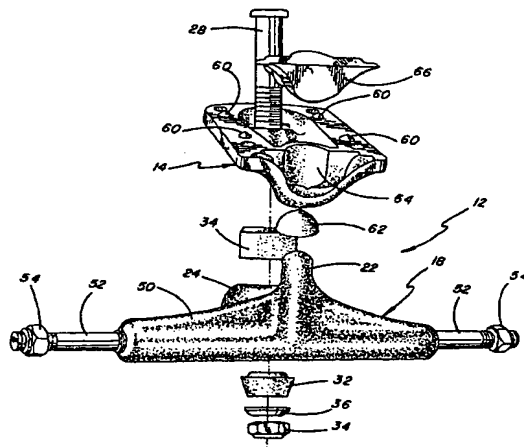
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(54) Title: **SKATEBOARD TRUCK ASSEMBLY**



(57) Abstract: A skateboard is disclosed having one or more truck assemblies configured to eliminate undesired ride characteristics such as hanger-jiggle and wheel bite, without sacrificing the skateboard's steering responsiveness. Each truck assembly includes an axle assembly with a ring-shaped hanger that is confined on a kingpin using a pair of bushings, at least one of which includes an annular flange that projects into an annular gap defined between the hanger and the kingpin. This prevents the hanger from moving laterally relative to the kingpin and thereby eliminates undesired ride characteristics such as hanger-jiggle and wheel bite. In a separate feature of the invention, the skateboard truck assembly further incorporates a low-friction slider plate that enhances the rider's performance of certain maneuvers and at the same time protects other components of the truck assembly from undue wear.

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## **SKATEBOARD TRUCK ASSEMBLY**

### **BACKGROUND OF THE INVENTION**

This invention relates generally to skateboards and, more particularly, to skateboards incorporating truck assemblies configured to minimize hanger-jiggle  
5 and wheel bite.

Skateboards typically include an elongated platform having a pair of truck assemblies mounted at the opposite ends of its underside. Each truck assembly incorporates a base plate secured to the platform and an axle/wheel assembly having a pair of wheels for propelling the skateboard along a path generally aligned with the  
10 skateboard's longitudinal axis. The axle/wheel assembly includes an axle that mounts the two wheels at its opposite ends, and it further includes a pivot stem that projects radially outward from a mid-portion of the axle for seating in a recess formed in the base plate. A ring-shaped hanger also projects radially outward from a mid-portion of the axle, at a prescribed acute angle (e.g., 45 degrees) relative to the  
15 pivot stem, for engagement with a kingpin that projects downwardly from the base plate. Upper and lower bushings secure the hanger around the kingpin.

The truck assemblies described briefly above are configured to enable a rider to steer the skateboard simply by shifting his/her weight distribution rightward or leftward on the skateboard platform. This weight shift causes the platform to tilt  
20 correspondingly relative to the axles of the two truck assemblies, which remain at all times level relative to the ground. The axles thereby are caused to pivot horizontally about the axes of their associated kingpins, which in turn causes the skateboard to steer rightward or leftward.

Riders generally desire to steer the skateboard using very slight shifts in their weight distribution. Loose or slack bushings generally allow greater movement of the ring-shaped hanger about the kingpin and thus are more responsive to slight weight shifts than are tight suspensions. However, loose or slack bushings  
5 can fail to prevent certain undesired ride characteristics.

One such undesired ride characteristic is hanger-jiggle, which occurs when the axle and hanger are allowed to move laterally relative to the axis of the kingpin. This can cause instability in the platform. Another such undesired ride characteristic is wheel bite, which occurs when the axle pivots excessively relative to  
10 the kingpin, to an extent that a wheel contacts the underside of the skateboard platform. This brakes the wheel and disturbs the rider's balance.

In the past, these undesirable ride characteristics typically have been avoided by tightening the bushings against the hanger. This tightening, however, can reduce the skateboard's steering responsiveness. It should, therefore, be appreciated  
15 that there is a need for a skateboard truck assembly that eliminates undesired ride characteristics such as hanger-jiggle and wheel bite, without sacrificing the skateboard's steering responsiveness.

Skateboard riders sometimes perform maneuvers called slides, in which a contact surface of the skateboard other than the wheels is made to slide along a  
20 fixed structure, such as a rail or a concrete wall. Because such riders typically seek to maximize the duration, speed and distance of the slides, a minimum loss of momentum is desired. However, friction between the skateboard's contact surface and the fixed structure can cause an excessive loss of momentum. This can make the maneuver difficult to perform and can damage the truck assembly. It should,  
25 therefore, be appreciated that there is a need for skateboard truck assembly

configured to minimize a loss of momentum when the skateboard is used in a slide maneuver.

### SUMMARY OF THE INVENTION

The present invention is embodied in a skateboard truck assembly  
5 configured to eliminate undesired ride characteristics such as hanger-jiggle and  
wheel bite, without sacrificing the skateboard's steering responsiveness. More  
particularly, the truck assembly includes a base plate configured to be secured to the  
underside of a skateboard platform and further configured to have an underside that  
defines a pivot recess. A kingpin projects downwardly from the underside of the  
10 base plate, at a predetermined angle toward the pivot recess, along the skateboard's  
longitudinal axis. The truck assembly further incorporates an axle/wheel assembly  
that includes 1) an axle, 2) first and second wheels mounted for rotation at opposite  
ends of the axle, 3) a ring-shaped hanger that projects from a mid-portion of the axle  
and defining an opening sized to be larger than the kingpin's cross-section, and 4) a  
15 pivot stem that projects from a mid-portion of the axle for seating in the pivot recess.  
The axle/wheel assembly is mounted on the underside of the base plate with the axle  
oriented substantially perpendicular to the skateboard's longitudinal axis, with the  
pivot stem seated in the pivot recess, and with the hanger disposed around the  
kingpin, such that an annular gap is defined between the hanger and the kingpin.  
20 Finally, a bushing assembly is disposed on the kingpin, adjacent to the ring-shaped  
hanger, wherein the bushing assembly is sized and configured to inhibit both axial  
and lateral movement of the hanger relative to the kingpin, while permitting limited  
pivoting of the hanger about the axis of the kingpin.

In more detailed features of the invention, the bushing assembly  
25 includes first and second bushings that encircle the kingpin on opposite sides of the  
hanger, such that the hanger is sandwiched between them. At least one of the

bushings includes an annular flange sized to fit into the annular gap defined between the hanger and the kingpin. The annular flange can be defined in just one of the bushings and an annular recess can be defined in the other bushing, for conformably receiving the annular flange. The bushings can be molded of polyurethane.

5                    In another feature of the invention, the base plate is configured to include a generally flat upper surface for securement to the underside of the skateboard platform, and one or more protrusions can project upwardly from this surface for engagement with the platform. This enhances the securement of the truck assembly to the platform.

10                   In a separate, independent feature of the invention, a low-friction slider plate can be secured to the base plate, on the side of the truck assembly opposite the kingpin. This minimizes friction between the skateboard and any fixed support structure during certain maneuvers. The slider plate can be flush with, or extend slightly beyond, the base plate. The slider plate can be located in a position such that  
15 it retains a pivot cup that defines the recess for seating the truck assembly's pivot stem.

                    Other features and advantages of the present invention will become apparent from the following description of the preferred embodiment, taken in conjunction with the accompanying drawings, which illustrate, by way of example,  
20 the principles of the invention.

**BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a perspective view of a skateboard and rider as he performs a slide maneuver along the upper edge of a concrete wall, with the underside of the skateboard platform and the facing surface of one of the skateboard's front truck assembly engaging the wall.

FIG. 2 is a front perspective view of a truck assembly of the skateboard of FIG. 1, with its wheels removed.

FIG. 3A is a fragmentary cross-sectional view of the truck assembly, taken in the direction of the arrows 3A-3A in FIG. 2, showing the skateboard's pivot cup and slider plate as two separate components.

FIG. 3B is a cross-sectional view similar to FIG. 3A, but of an alternative embodiment in which the pivot cup and slider plate are integrated together as a single component.

FIG. 4 is an exploded view of the truck assembly of FIG. 2.

FIG. 5 is a side elevational view, partially broken away, of the truck assembly, taken in the direction of the arrows 5-5 in FIG. 2, the truck assembly being shown mounted on the underside of the skateboard platform.

FIG. 6 is a detailed cross-sectional view of the portion of the truck assembly and skateboard platform identified by the arrows 6 in FIG. 5, showing a bolt for attaching the truck assembly to the platform and further showing a conical projection that engages the underside of the platform.

FIG. 7 is a bottom isometric view of an upper bushing that is part of the truck assembly of FIG. 2.

FIG. 8 is a top isometric view of a lower bushing that is part of the truck assembly of FIG. 2.

## 5 DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in the exemplary drawings, and particularly in FIGS. 1, 2, 4 and 5, the invention is embodied in a skateboard 10 incorporating two improved truck assemblies 12. Each truck assembly includes a base plate 14 secured to one end of the underside of a skateboard platform 16, and it further includes an axle assembly 18 mounted on the base plate. Two wheels 20 are mounted at opposite ends of the axle assembly, for propelling the skateboard in a direction aligned generally with the skateboard's longitudinal axis.

As is conventional, the axle assembly 18 is configured to include a pivot stem 22 and a ring-shaped hanger 24 that are normal to, and project radially outward from, a mid-portion of the axle assembly, at an angle of about 45° relative to each other. The pivot stem is seated in a pivot recess 26 formed near one end of the base plate 14, and the hanger encircles a kingpin 28 that projects downwardly from the base plate at a location spaced from the recess. Upper and lower bushings 30 and 32, respectively, also encircle the kingpin, sandwiching the hanger. A nut 34 and washer 36 are attached to the threaded end of the kingpin, to secure the hanger and bushings in place. In its attached position, the axle assembly 18 is oriented such that the pivot stem 22 is seated in the pivot recess 26 at an angle of about 70° relative to the plane of the skateboard platform 16, in the direction of the kingpin 28. The

kingpin also is oriented at an angle of about 70° relative to this same plane, but in the direction of the recess.

A rider 38 (FIG. 1) can steer the skateboard 10 leftward or rightward simply by shifting his/her weight to one side or the other on the skateboard platform 16, while the wheels 20 and the axle assembly 18 of each truck assembly 12 remain level relative to the ground. This weight shift, coupled with the non-perpendicular angle of the kingpin 28 relative to the plane of the platform, causes each axle assembly to pivot on its pivot stem 22 about the axis of its kingpin. The opening in the ring-shaped hanger 24 is somewhat larger than the diameter of the kingpin, such that an annular gap 40 is formed between them, to facilitate this pivoting movement. Thus, a rightward weight shift causes the axle assembly of the skateboard's front truck assembly 12 to pivot to the right and the axle assembly of the rear truck assembly 12 to pivot to the left, steering the skateboard to the right. An opposite result occurs from a leftward weight shift.

Riders generally desire to steer the skateboard 10 using very slight shifts in their weight. In the past, this has been achieved by tightening the bushings 30 and 32 loosely on the ring-shaped hanger 24. This allows greater movement of the hanger about the kingpin 28 and thus greater responsiveness to slight weight shifts. However, loose or slack bushings can fail to prevent undesired ride characteristics such as hanger-jiggle and wheel bite. There has been a need for a truck assembly that can provide the desired steering responsiveness without causing such undesired ride characteristics.

The skateboard truck assembly 12 of the invention satisfies this need by specially configuring the upper and lower bushings 30 and 32, respectively, to inhibit lateral movement of the hanger 24 relative to the kingpin 28. Specifically, the lower bushing 32 is configured to include an annular projection or flange 42 sized



and positioned to project through the annular gap 40 located between the hanger and the kingpin, for reception in a mating annular recess 44 formed in the upper bushing 30. The outer periphery of the flange maintains continuous engagement with the hanger and thereby effectively prevents the hanger from moving laterally relative to the kingpin. This reduces the occurrence of hanger-jiggle and wheel bite. Moreover, it prevents this lateral movement without the need to excessively tighten the bushings onto the hanger, which could frictionally inhibit the desired pivoting of the hanger about the kingpin. The lack of lateral hanger movement causes steering response to be vastly improved.

10               The annular flange 42 of the lower bushing 32 is configured such that it provides proportionately greater resistance to tilting of the skateboard platform 16 as the rider 38 shifts his/her weight by an increasing amount. This enhances the skateboard's resistance to undesired wheel bite.

15               In the preferred embodiment, the upper bushing 30 (see FIG. 7) is generally cylindrical in shape, with an outer diameter of about 2.5 cm and a height of about 1.4 cm. A bore 46 of about 1 cm diameter extends longitudinally through the upper bushing, for receiving the kingpin 28. The annular recess 44 immediately surrounds the bore, with an outer diameter of about 1.4 cm and a depth of about 0.25 cm.

20               The lower bushing 32 (see FIG. 8) is generally frusto-conical in shape, with a diameter at its upper end of about 2.5 cm, a diameter at its lower end of about 2 cm, and a height of about 1 cm. A bore 48 of about 1 cm extends longitudinally through the lower bushing, for receiving the kingpin 28. The annular flange 42 immediately surrounds the bore 48, and it has a two-part frusto-conical shape. The flange's height is about 0.4 cm, just sufficient to extend through the annular gap 40 in the hanger 24 and nest in the annular recess 44 of the upper bushing 30.

25

The upper and lower bushings 30 and 32 both can be formed of a suitable resilient material such as polyurethane. It should be understood that the locations of the annular flange 42 and annular recess 44 on the respective lower and upper bushings alternatively could be reversed.

5           The axle assembly 18 preferably includes a main body 50 formed of cast aluminum and an axle 52 formed of hardened steel. The pivot stem 22 and the hanger 24 preferably are cast as part of this main body. The two ends of the axle are threaded, and a pair of nuts 54 secure the wheels 20 in place.

10           As best shown in FIGS. 2, 5 and 6, the base plate 14 is secured to the underside of the skateboard platform 16 by four screws 56 and associated nuts 58. The base plate preferably is formed of cast aluminum, and its upper surface defines a flat, generally rectangular surface. Four conically shaped protrusions 60 project upwardly from the surface, for gripping engagement with the platform, to enhance the base plate's securement.

15           As mentioned above, the pivot stem 22 of the axle assembly 12 is seated in the pivot recess 26 formed in the underside of the base plate 14. As shown in FIG. 3A, this pivot recess is formed by a special polyurethane pivot cup 62 that is seated in an opening 64 cast into the base plate. The pivot cup is backed by a plastic slider plate 66 whose function will be described below. The slider plate is installed  
20 in its position before the base plate is secured to the skateboard platform 16, after which it is automatically prevented from removal after the base plate has been secured in place. FIG. 3B depicts an alternative embodiment in which the pivot cup and slider plate are molded as a single plastic component 68.

25           In both cases, the plastic slider plate 66 of FIG. 3A and the slider plate 68 of FIG. 3b have irregular shapes and extend at least as far as, or preferably

beyond, the furthest extent of the base plate 14. Consequently, the slider plate will be the particular component that engages an external support surface such as a concrete wall 70 (FIG. 1), when the rider 38 uses the skateboard 10 to perform a slide maneuver or the like. This plastic surface provides substantially less frictional resistance than would the cast aluminum base plate and, thereby, enables the rider to execute the maneuver with greater skill. At the same time, the slide plate protects the base plate from undue wear. The slide plate can be readily replaced without undue expense after it has been sacrificially worn-out.

It should be appreciated from the foregoing description that the present invention provides a skateboard having one or more improved truck assemblies configured to eliminate undesired ride characteristics such as hanger-jiggle and wheel bite, without sacrificing the skateboard's steering responsiveness. This is achieved by providing an axle assembly with a hanger that is confined on a kingpin using a pair of bushings, at least one of which includes an annular flange that projects into an annular gap defined between the hanger and the kingpin. This prevents the hanger from moving laterally relative to the kingpin and thereby eliminates undesired ride characteristics such as hanger-jiggle and wheel bite. In a separate feature of the invention, the skateboard truck assembly further incorporates a low-friction slider plate that enhances the rider's performance of certain maneuvers and at the same time protects other components of the truck assembly from undue wear.

While a particular form of the invention has been illustrated and described, it will be apparent that various modifications can be made without departing from the invention. Accordingly, the invention is to be defined only by the following claims.

## I CLAIM:

1. A skateboard truck assembly configured to be secured to the underside of a skateboard platform, the truck assembly comprising:

a base plate configured to be secured to the underside of the skateboard platform and further configured to have an underside that defines a pivot recess;

5 a kingpin projecting downwardly from the underside of the base plate, from a location spaced from the pivot recess, wherein the kingpin is oriented at a predetermined angle toward the pivot recess, and wherein the kingpin and the pivot recess are aligned with a longitudinal axis of the skateboard platform;

an axle/wheel assembly including

10 an axle,

first and second wheels mounted for rotation at opposite ends of the axle,

15 a ring-shaped hanger projecting from a mid portion of the axle and defining an opening sized to be larger than the cross-section of the kingpin, and

a pivot stem projecting from a mid portion of the axle and configured to be seated in the pivot recess defined in the underside of the base plate,

20 wherein the axle/wheel assembly is mounted on the underside of the base plate with the axle oriented substantially perpendicular to the longitudinal axis of the skateboard platform, with the pivot stem seated in the pivot recess, and with the hanger disposed around the kingpin, wherein an annular gap is defined between the hanger and the kingpin; and

25 a bushing assembly disposed on the kingpin, adjacent to the ring-shaped hanger, wherein the bushing assembly is sized and configured to inhibit both

axial and lateral movement of the hanger relative to the kingpin, while permitting limited pivoting of the hanger about the axis of the kingpin.

2. A skateboard truck assembly as defined in claim 1, wherein the bushing assembly comprises:

a first bushing encircling the kingpin on a first side of the hanger; and

a second bushing encircling the kingpin on a second side of the hanger,  
5 opposite the first side, such that the hanger is sandwiched between the first and second bushings;

wherein at least one of the first and second bushings includes an annular flange sized to fit into the annular gap defined between the hanger and the kingpin.

3. A skateboard truck assembly as defined in claim 2, wherein:  
the annular flange is defined in just the first bushing; and  
an annular recess is defined in the second bushing, for conformably  
receiving the annular flange included in the first bushing.

4. A skateboard truck assembly as defined in claim 2, wherein:  
the first and second bushings are molded of polyurethane.

5. A skateboard truck assembly as defined in claim 1, wherein:  
the base plate further is configured to have a substantially vertical  
facing surface adjacent to the pivot recess, on the side of the pivot recess opposite  
the kingpin; and

5 the truck assembly further comprises a wear-resistant slider assembly  
secured adjacent to the facing surface of the base plate.

6. A skateboard truck assembly as defined in claim 5, wherein the slider assembly comprises:

a slider plate that is secured adjacent to the facing surface and extending flush with, or slightly beyond, the facing surface; and

5 a pivot cup that frictionally rests in the pivot recess.

7. A skateboard truck assembly as defined in claim 6, wherein:  
the pivot cup is formed of polyurethane; and  
the slider plate is formed of a plastic material.

8. A skateboard truck assembly as defined in claim 1, wherein:  
the base plate is further configured to have a generally horizontal, flat top surface that contacts the skateboard platform; and

5 the truck assembly further comprises one or more spikes that extend from the top surface and frictionally engage the skateboard platform.

9. A skateboard truck assembly configured to be secured to the underside of a skateboard platform, the truck assembly comprising:

a base plate configured to be secured to the underside of the skateboard platform and further configured to have an underside that defines a pivot recess and  
5 to have a generally vertical facing surface adjacent to the pivot recess;

a kingpin projecting downwardly from the underside of the base plate, from a location spaced from the pivot recess, wherein the kingpin is oriented at a predetermined angle toward the pivot recess, and wherein the kingpin and the pivot recess are aligned with a longitudinal axis of the skateboard platform;

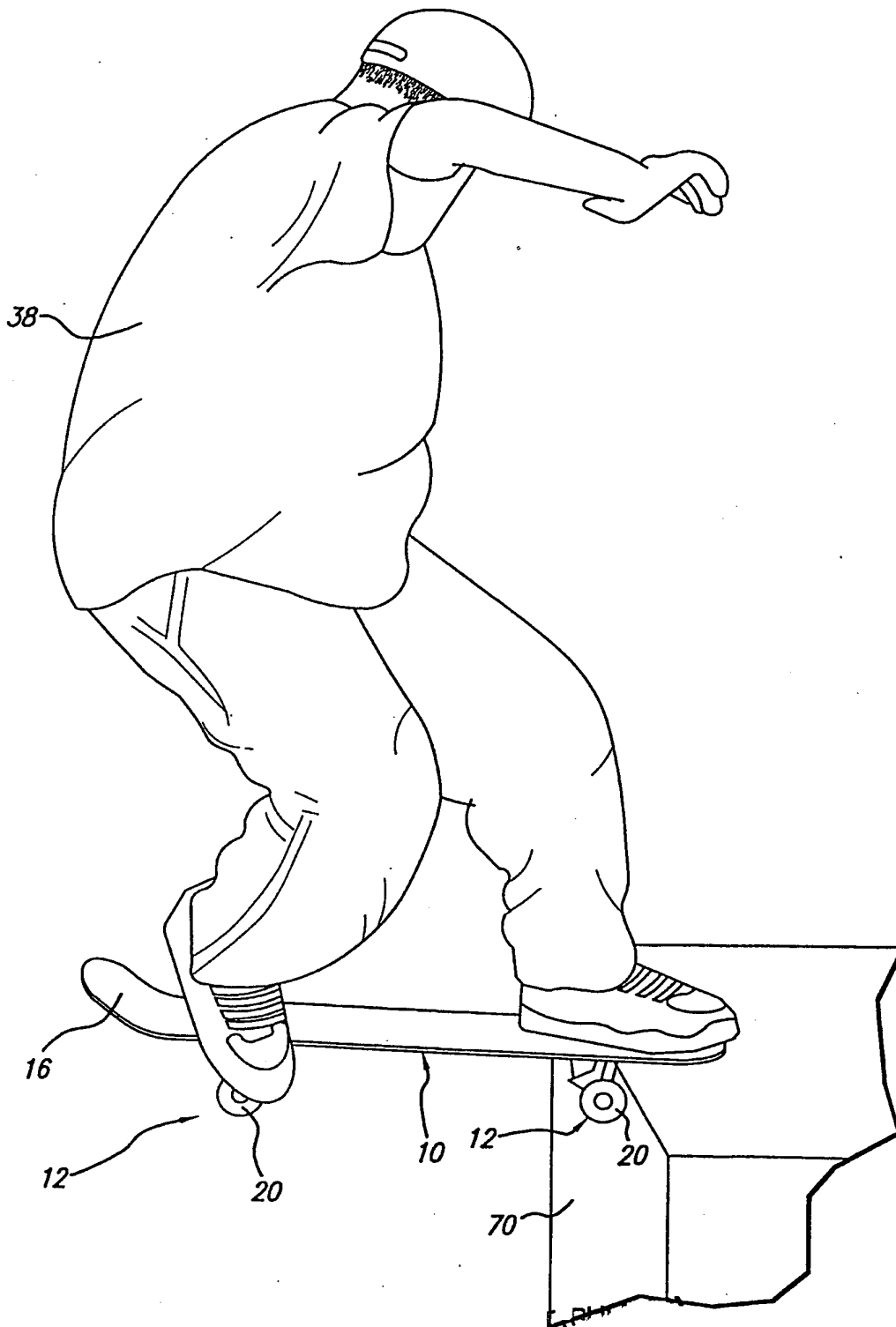
10 an axle/wheel assembly having

an axle,

first and second wheels mounted for rotation at opposite ends of the axle,

15                   a ring-shaped hanger projecting from a mid portion of the  
axle and defining an opening disposed over the kingpin, and  
                  a pivot stem projecting from a mid portion of the axle  
and configured to be seated in the pivot recess defined in the  
underside of the base plate,  
                  wherein the axle/wheel assembly is mounted on the  
20               underside of the base plate with the axle oriented substantially  
perpendicular to the longitudinal axis of the skateboard  
platform, with the pivot projection seated in the pivot recess  
defined in the underside of the base plate, and with the hanger  
disposed around the kingpin; and  
25               a low-friction slider plate secured adjacent to the substantially vertical  
facing surface of the base plate.

FIG. 1







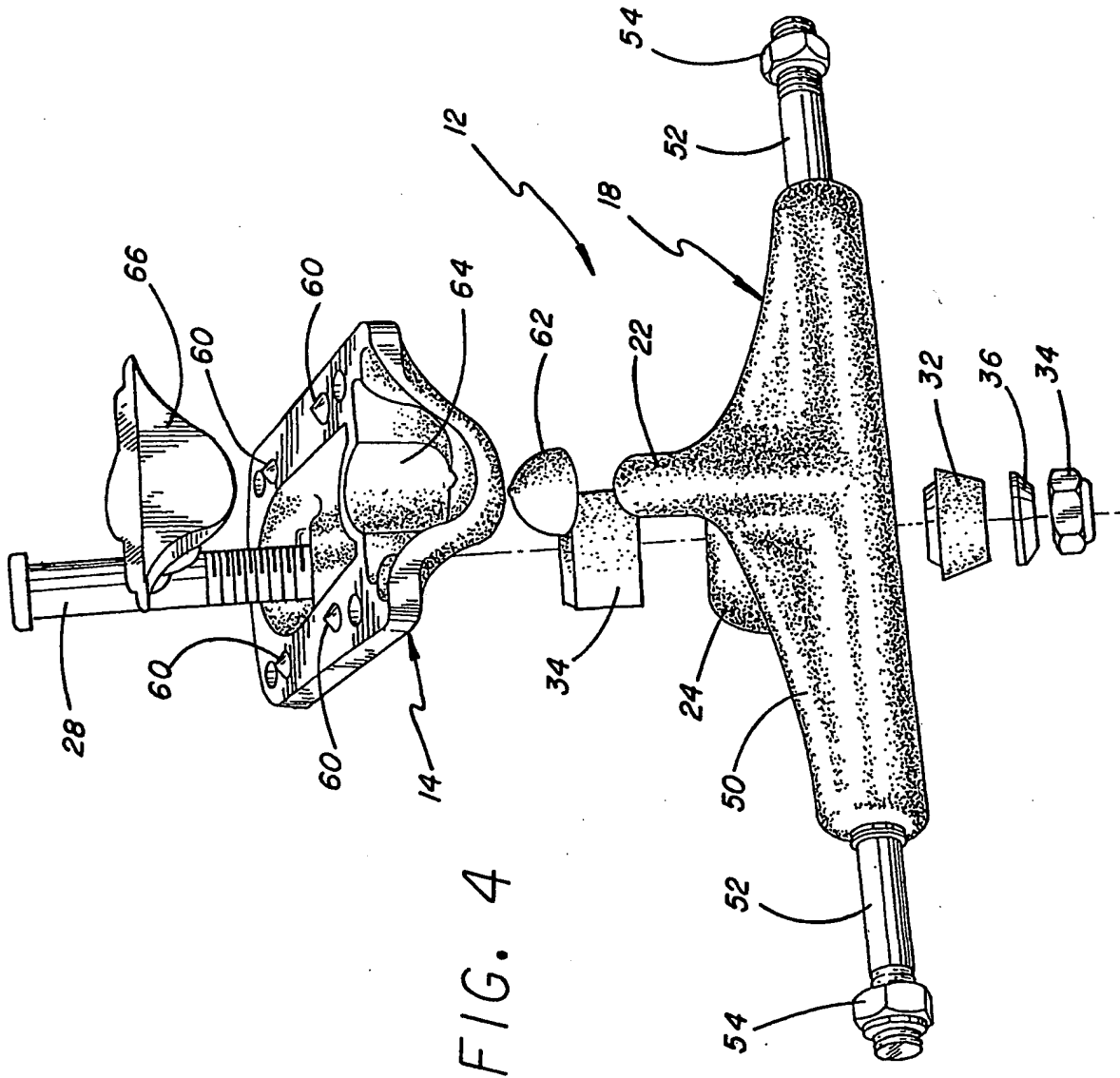
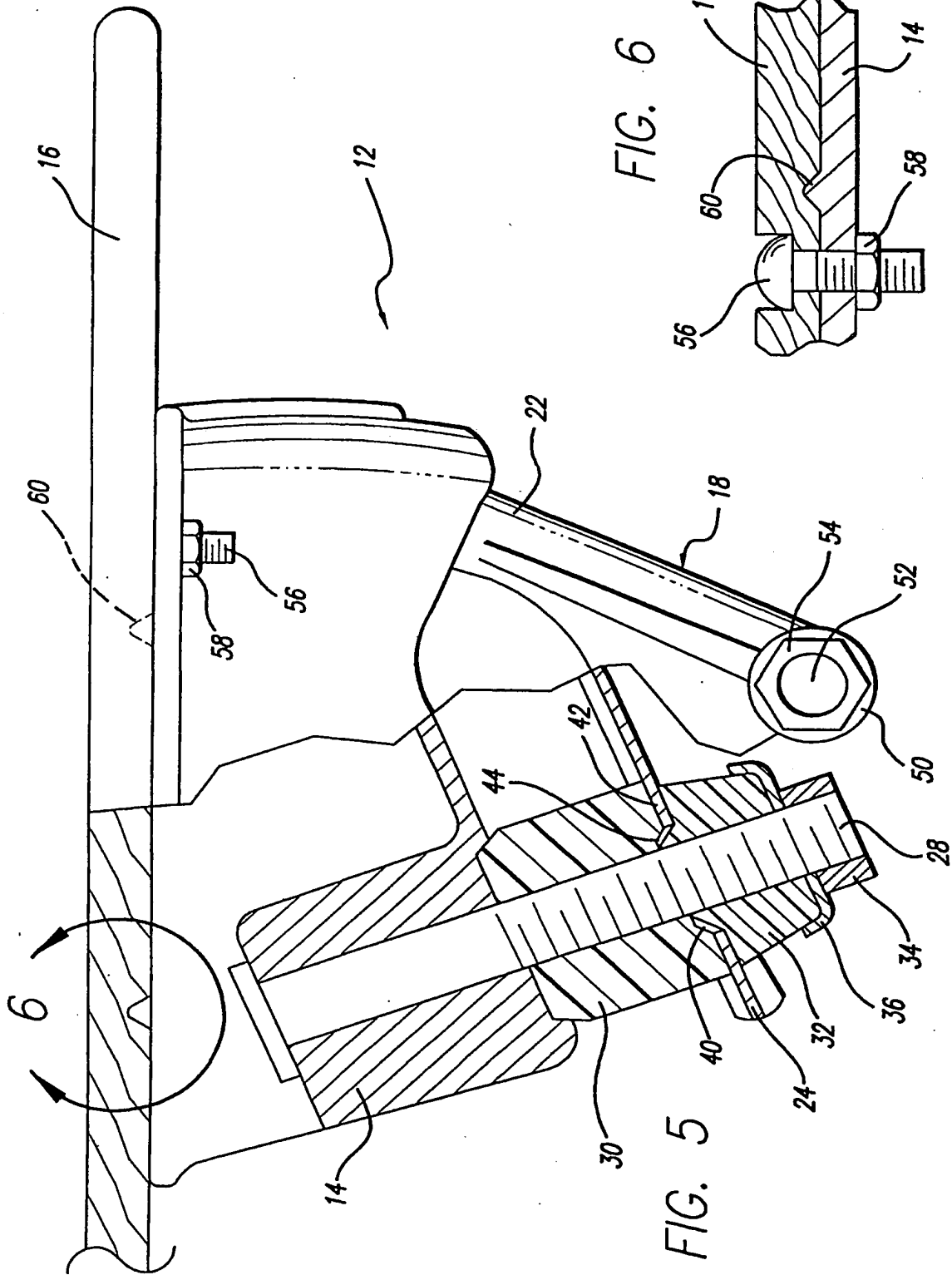


FIG. 4



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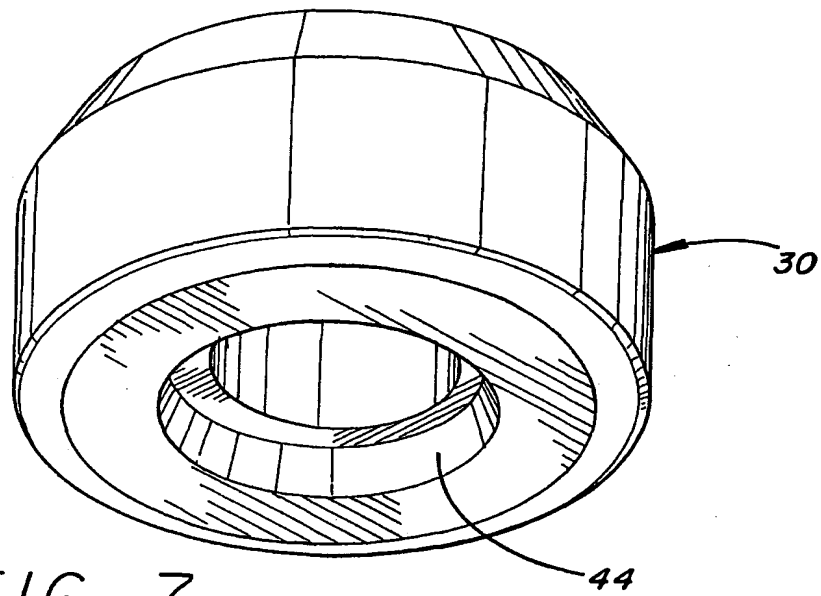


FIG. 7

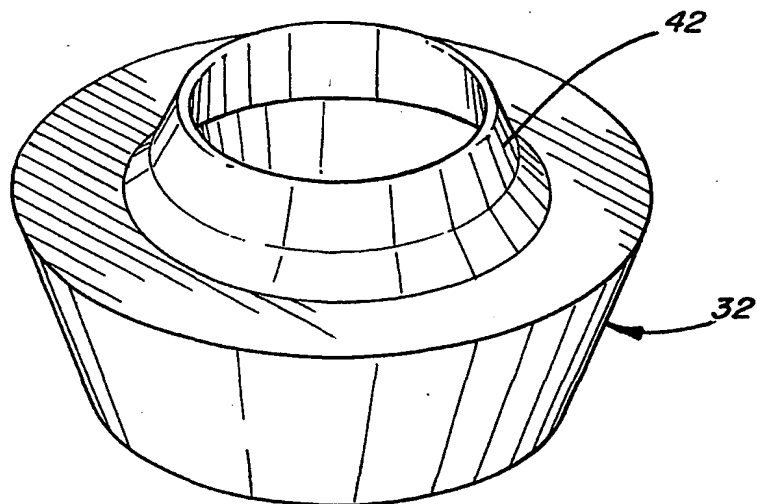


FIG. 8

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/16345

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 A63C17/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A63C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	EP 1 080 751 A (UNICOMM CORP. NAGOYA) 7 March 2001 (2001-03-07)	1,2,4
A	column 4; figures 1-14	3,5-9
X	US 6 056 302 A (SMITH) 2 May 2000 (2000-05-02)	1,5
A	column 3, paragraph 2; figures 1-3	2-4,6-9

☐ Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Date of the actual completion of the international search

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Name and mailing address of the ISA

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1080751	A	07-03-2001	JP 2001062023 A EP 1080751 A1	13-03-2001 07-03-2001
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